Results of forest insect and disease surveys in the CENTRAL REGION of Ontario, 1990

CARRIED OUT BY THE GREAT LAKES FORESTRY CENTRE IN COOPERATION WITH THE ONTARIO MINISTRY OF NATURAL RESOURCES

W.D. Biggs, C.G. Jones and E.J. Czerwinski

Miscellaneous Report No. 103

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FORESTRY CANADA, ONTARIO REGION

Ontario Region is one of six regional establishments located across Canada and operated by Forestry Canada. The overall objective of Forestry Canada is to promote the preservation, enhancement and wise use of a healthy, attractive and bountiful forest resource and terrestrial environment for the economic and social benefit of all Canadians. Ontario Region pursues this objective by conducting two major programs: research and technical services and forestry development. Both programs address major problems affecting forest management and the forest environment primarily in Ontario, but because of the transprovincial nature of the forest resource, many elements of our research program are of national significance.

Ontario Region specializes in research in forest production, forest protection, forest environment and forest utilization. These programs deal directly with the issue of maintaining and enhancing the resource supply. Activities range from basic to applied and developmental research, and include a significant technology transfer component.

Major activities in forestry development include federal management responsibility for federal-provincial forest management agreements, participation in the National Forestry Statistics program and forest economics research.

Close working relationships are maintained with the Ontario Ministry of Natural Resources, the forest industry, educational institutions specializing in forestry and the biological sciences, and other forestry organizations within the province. Ontario Region is represented on the Ontario Forestry Council and the Ontario Forestry Research Committee, which have responsibility for coordinating forestry research in Ontario.

It is recognized that forested land must be managed in the best public interest, not only for the wood production essential to our economy, but also for the recreational purposes that are so important to our social well-being. This must be achieved in a manner that will maintain or improve the quality of the forest environment and preserve it for generations to come.

92-05257/

RESULTS OF FOREST INSECT AND DISEASE SURVEYS IN THE CENTRAL REGION OF ONTARIO 1990

(FOREST DISTRICTS: HURONIA, LINDSAY, CAMBRIDGE, MAPLE and NIAGARA)

W.D. Biggs, C.G. Jones and E.J. Czerwinski

FORESTRY CANADA

ONTARIO REGION

GREAT LAKES FORESTRY CENTRE

1991

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SURVEY HIGHLIGHTS

This report presents data collected by the Forest Insect and Disease Survey (FIDS) in 1990 on various insects, diseases and abiotic damage in the Central Region of Ontario. Population levels of the gypsy moth increased this year, with moderate-to-severe defoliation mapped in Cambridge District for the first time. Cedar leafminer, spruce budworm and larch casebearer populations were also up in 1990. Both the forest and eastern tent caterpillars experienced declines in population levels; however, the former still had a major presence in Huronia District.

There were no changes in the status of major tree diseases; however, more hardwood foliar diseases were observed in 1990. Plots for monitoring sugar maple and red oak health were retallied, as were the Acid Rain National Early Warning System plots. Pest information obtained from the two Ontario Ministry of Natural Resources (OMNR) forest tree nurseries is included in this report.

Insects and diseases described in this report fall into three categories, on the basis of their importance:

Major Insects or Diseases

capable of causing serious injury to or death of living trees or shrubs

Minor Insects or Diseases

capable of causing sporadic or localized injury but not usually a serious threat to living trees or shrubs. (No minor insects or diseases were reported in Central Region in 1990).

Other Forest Insects and Diseases (Tables)

These tables provide information on two types of pest:

(1) those that are of minor importance and have not been known to cause serious damage to forest trees, and
(2) those that are capable of causing serious damage but, because of low population levels or for other reasons, did not cause serious damage this year.

The cooperation and assistance provided by OMNR and other government agencies and individuals are gratefully acknowledged.

If further information is required about pest conditions in Central Region, please contact W.D. Biggs or write to the Chief, Forest Insect and Disease Survey Unit, Forestry Canada, Ontario Region, P.O. Box 490, Sault Ste. Marie, Ontario, P6A 5M7.

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INSECTS

Major Insects

Cedar Leafminers, *Argyresthia aureoargentella* Brower, *A. canadensis* Free., *A. thuiella* (Pack.), and *Coleotechnites thujaella* (Kft.)

Damage levels were higher in 1990 at one location in Central Region. Moderate-to-severe browning of eastern white cedar (*Thuja occidentalis* L.) foliage was observed in the southeastern corner of Maple District. Foliar browning levels in the 75-100% range were detected in scattered stands over a gross area of about 26,650 ha in much of Uxbridge and Pickering townships (Fig. 1). Pockets of damage less than 1 ha in size, with 30 to 40% foliar browning, were found in Tecumseth and Nottawasaga townships in Huronia District. Population levels were sufficient to cause 10 to 20% browning in many stands scattered across the remainder of the Region.

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

Province-wide, an increase of more than 500,000 ha of moderate-to-severe defoliation was mapped. The infestations were mainly in the Northeastern and North Central regions, along with new infestations in the Northern and Algonquin regions. This brings the total area infested in Ontario to 6,783,261 ha in 1990. The gross area of budworm-killed balsam fir (*Abies balsamea* [L.] Mill.) covered 3,098,189 ha in the Northwestern and North Central regions. This represents an increase of some 1,214,473 ha over the area affected in 1989 in these regions. Mortality that occurred during the early part of the outbreak (1972 to 1984) in northeastern and southern Ontario has been dropped from the total.

In Central Region, population levels remained high at the same two locations reported on in 1989, and two additional areas of moderate damage were found in 1990 (Fig. 2). Defoliation levels averaged 80% on 19-m white spruce (*Picea glauca* [Moench] Voss) in a 7-ha plantation in Adjala Township, Huronia District, and just up the road in a 10-m white spruce seed production area, current defoliation levels ranged from 30 to 70%. Approximately 4 ha of white spruce had defoliation levels averaging 75% in Uxbridge Township, Maple District. At the two new damaged stands, defoliation levels averaged 40% on 18-m trees over a 4-ha white spruce plantation in the Wildman Tract in Tiny Township, Huronia District, and in a 9-m white spruce seed orchard at the Orono Forest Tree Nursery in Clarke Township, Lindsay District.

An egg-mass survey was carried out during late July at three locations in the Region. The results indicate that the population levels will remain stable at these locations. A severe infestation is forecast for 1991 at the plantation in Uxbridge Township, Maple District; a moderate-to-severe infestation is forecast for the seed orchard in Clarke Township, Lindsay District; and a moderate infestation level is predicted for 1991 at the plantation in Adjala Township, Huronia District.

HURONIA, MAPLE and LINDSAY DISTRICTS

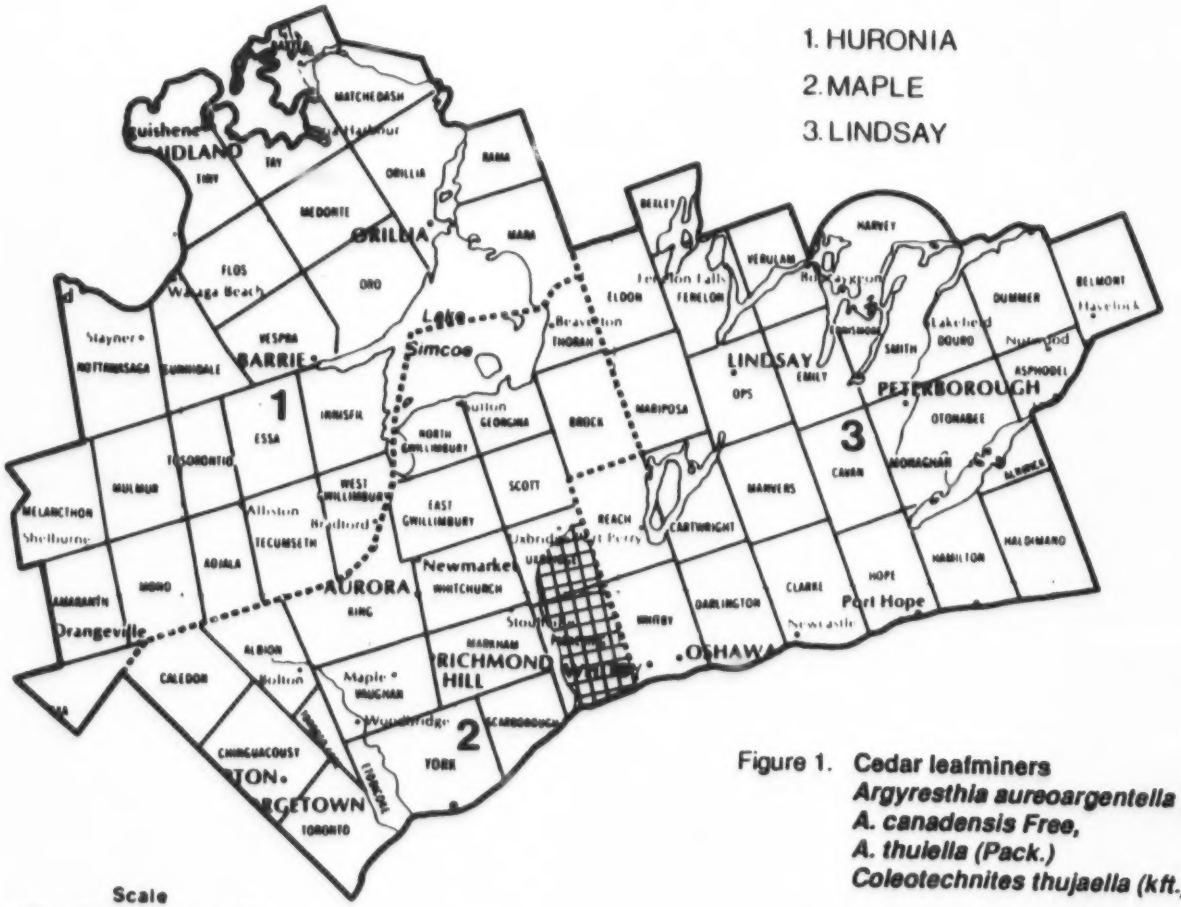

Figure 1. **Cedar leafminers**
Argyresthia aureoargentella Brower,
A. canadensis Free,
A. thuiella (Pack.)
Coleotechnites thujaella (kft.)

Areas within which moderate-to-severe damage occured in 1990.....

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HURONIA, MAPLE and LINDSAY DISTRICTS

Figure 2. **Spruce budworm**
Choristoneura fumiferana (Clem.)

Areas within which defoliation occurred in 1990

Moderate-to-severe .....
Moderate .....

Forest Insect and Disease Survey
Great Lakes Forestry Centre

Larch Casebearer, *Coleophora laricella* (Hbn.)

The high population levels present in 1989 continued this year, with additional areas of damage found. The largest damaged single stands were in Huronia District (Fig. 3). Approximately 100 ha of tamarack (*Larix laricina* [Du Roi] K. Koch) were severely defoliated in the Minesing Swamp in Vespra Township, and a 7-ha plantation of European larch (*L. decidua* Mill.) had foliar browning levels of 75 to 100% in West Gwillimbury Township. The next-largest area of damage was 6 ha of tamarack in Erin Township, Cambridge District, where foliar browning levels were between 50 and 60%. Foliar damage levels of 80 to 90% were observed in 5-ha tamarack stands in each of Asphodel and Fenelon townships in Lindsay District, with similar damage levels observed in a European larch plantation in Clarke Township, also in Lindsay District. Larch casebearer populations were sufficiently high to cause foliar browning in the 80-100% range in European larch ranging in height from 10 to 16 m in plantations averaging about 0.5 ha in size in Flos, Medonte, Oro, Adjala, Innisfil, Mono and Tecumseth townships in Huronia District; the situation was similar in Albion Township, and at three sites in each of Uxbridge and Whitchurch townships, Maple District. Tamarack of varying size in an area of about 2 ha had 100% damage levels in Nassagaweya Township, Cambridge District, and European larch plantations were also attacked in Arthur and West Luther townships. Moderate damage was observed on ornamental European larch along the Niagara Parkway in Niagara District. Populations causing noteworthy discoloration of larch were present at many other locations across the remainder of the Region.

Oak Leaf Shredder, *Croesia semipurpurana* (Kft.)

Populations of this pest of oak *(Quercus* spp.) remained at very low levels across the Region. In one stand in Huronia District, where study plots have been monitored, defoliation levels reached approximately 20%; defoliation in the other stands was at lower levels (Table 1). At the study locations, egg sampling was also carried out to determine population levels for the next season. It appears that population levels may increase at a couple of sites in Niagara District. Sufficient numbers of oak leaf shredder eggs were found on branches from the West Lincoln Township plot that high population levels are predicted for 1991; moderate defoliation levels should occur in the Thorold plot (Table 1). Endemic populations are expected at the other locations where egg sampling was carried out.

Gypsy Moth, *Lymantria dispar* (L.)

There was a significant increase in the amount of damage caused by this insect in 1990 in all districts with the exception of Lindsay District (Table 2).

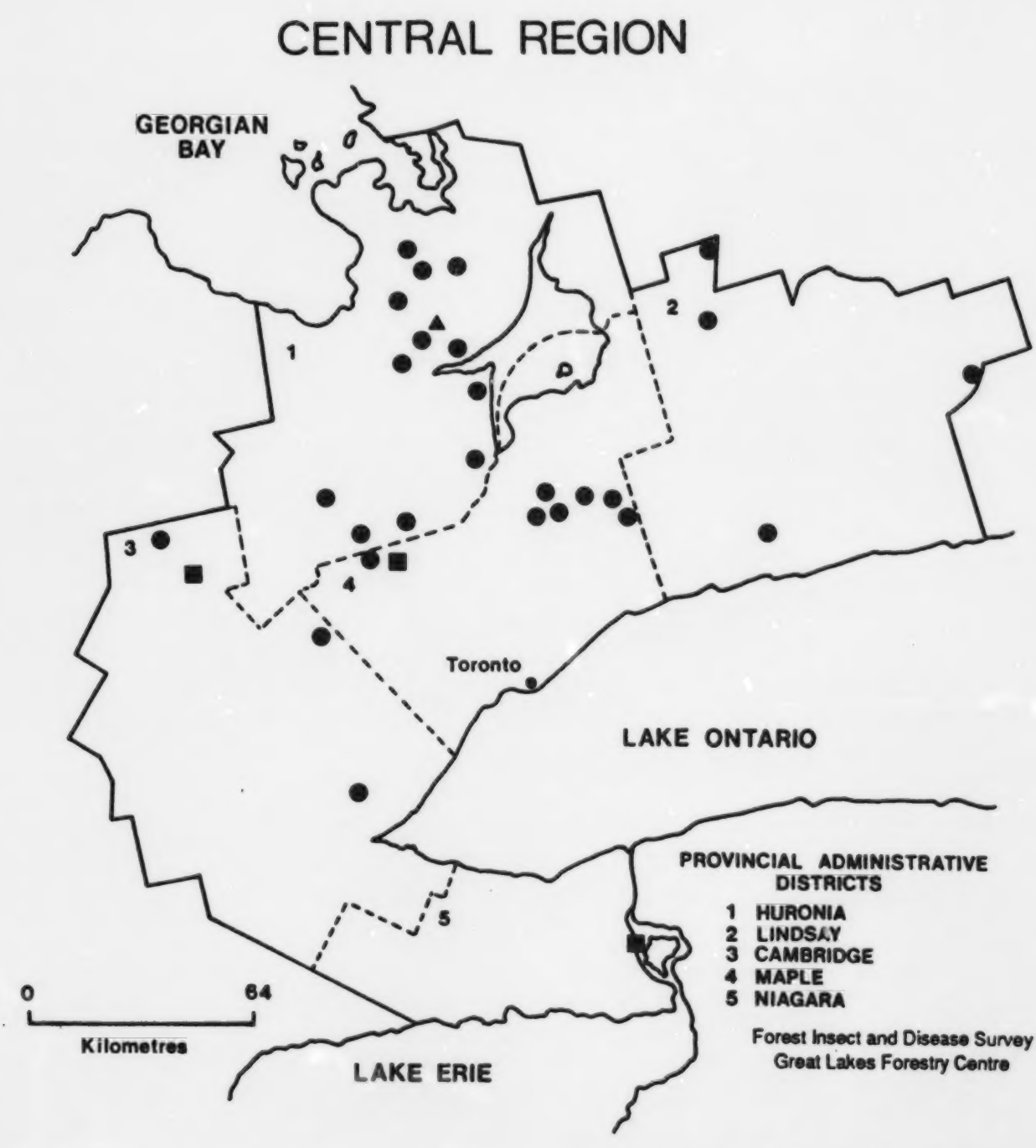

Figure 3. Larch casebearer
Coleophora laricella Hbn.

Areas within which foliar damage occured in 1990.

Severe.....●
Moderate.....■
Light.....▲

Table 1. Results of oak leaf shredder pheromone trapping, defoliation estimates and egg counts in 1990, and defoliation forecasts for 1991 in the Central Region of Ontario.

Location	Plot no.	Total no. of adults captured[a] 1989	Total no. of adults captured[a] 1990	Avg. no. per trap 1989	Avg. no. per trap 1990	Total no. of adults captured[b] 1989	Total no. of adults captured[b] 1990	Pheromone concentration 1990 (%)	Leaves attacked 1990 (%)	Foliar damage 1990 (%)	Total no. of eggs 1989	Total no. of eggs 1990	Defoliation forecast for 1991
Huronia District													
Awenda Prov. Pk	4[c]	17	0	3.4	0.0	-	-	.003	-[d]	-[d]	4	0	Nil
	5	9	0	1.8	0.0	-	-	.003	-[d]	-[d]	0	0	Nil
	11	373	52	74.6	10.4	116	21	.03	-[d]	-[d]	0	0	Nil
Dufferin County Forest	3	0	0	0.0	0.0	-	-	.003	5	2	0	0	Nil
	9	4	0	0.8	0.0	-	-	.003	62	7	0	0	Nil
	10	730	366	146.0	73.2	236	19	.03	5	2	2	0	Nil
	12	1	0	0.2	0.0	-	-	.003	10	4	0	0	Nil
	95	353	57	70.6	11.4	242	362	.03	15	3	0	0	Nil
Check	3	726	593	145.2	118.6	966	101	.03	90	22	96	2	Light
Hendrie	1	103	10	20.6	2.0	-	-	.003	0	0	7	2	Light
Midhurst	1	126	0	25.2	0.0	23	5	.03	0	0	0	0	Nil
Orr Lake, Daniels		323	51	64.6	10.2	188	33[e]	.03	25	4	0	1	Light
Wildman Tract	4	1	0	0.2	0.0	-	-	.003	0	0	0	0	Nil
	7	189	45	37.8	9.0	113	2	.03	0	0	0	0	Nil
Maple District													
Uxbridge Twp	1[c]	24	0	4.8	0.0	-	-	.003	0	0	11	0	Nil
	2	674	29	134.8	5.8	440	28	.03	0	0	2	0	Nil
Niagara District													
Cayuga Twp	1	41	17	8.2	3.4	-	-	.003	-[d]	-[d]	0	3	Light
Thorold	6	825	136	165.0	27.2	-	-	.003	-[d]	-[d]	29	75	Moderate
Pelham	7	955	812	191.0	162.4	2472	98	.03	-[d]	-[d]	29	4	Light
West Lincoln Twp	2	986	607	197.2	121.4	2462	219	.03	-[d]	-[d]	18	283	High

[a] in five "sticky traps"
[b] in two "multipher traps"
[c] Sprayed with *Bacillus thuringiensis* in 1990 against gypsy moth.
[d] Area defoliated by forest tent caterpillar and/or gypsy moth
[e] One trap missing

The greatest increase in populations was recorded in Niagara District, where the area infested increased by just over 17,000 ha (Table 2). Pockets of moderate-to-severe defoliation are now located throughout most of the district (Fig. 4). The largest single infestation was found on mainly red oak (*Quercus rubra* L.) in an area along the Caistor-Canborough Township line. The next largest infestation was in Wainfleet Township, where willow (*Salix* spp.) and trembling aspen (*Populus tremuloides* Michx.) again sustained moderate-to-severe defoliation in the Wainfleet Marsh. Various-sized pockets of moderate-to-severe defoliation were scattered from the Cayuga area east through portions of Seneca and North and South Cayuga townships, and infesting most of Canborough, Caistor and Gainsborough townships. Smaller, more widely scattered pockets were found in Pelham, Wainfleet, Humberstone, Crowland and Willoughby townships. Moderate-to-severe defoliation was also found in the Six Nations Indian Reserve in Oneida Township, which was part of a large infestation to the northwest in Cambridge District. In Niagara District, a double application of *Bacillus thuringiensis* (B.t.) was used to combat the gypsy moth over a total of 1,570 ha, most of which was private land (1,477 ha) with the remainder provincial Crown land (85 ha) and federal Crown land (8 ha).

Table 2. Gross area of moderate-to-severe defoliation by the gypsy moth in the Central Region of Ontario from 1987 to 1990.

District	Area of moderate-to-severe defoliation (ha)				Change from 1989 to 1990
	1987	1988	1989	1990	
Cambridge	0	0	0	3,323	+3,323
Huronia	0	0	0	2,418	+2,418
Lindsay	888	861	4,071	1,118	-2,953
Maple	0	0	370	2,291	+1,921
Niagara	0	28	2,177	19,474	+17,297
	888	889	6,618	28,624	+22,006

Cambridge District had the next-largest area infested in 1990, with moderate-to-severe defoliation observed for the first time (Table 2). The largest area damaged was on the Six Nations and New Credit Indian reserves in Tuscarora Township. In this area, there were a half-dozen pockets, totaling 2,574 ha, of mixed oak stands that were defoliated. Smaller pockets of mainly red oak and white oak (*Q. alba* L.) were also mapped from the Oakville area southwest to the Ancaster area; two were located in Trafalgar Township, four were between Highways 403 and 5 near the town of Waterdown, and the others were between the towns of Dundas and Ancaster (Fig. 4). Spray operations were carried out on 300 ha of private land in the Dundas-Ancaster area.

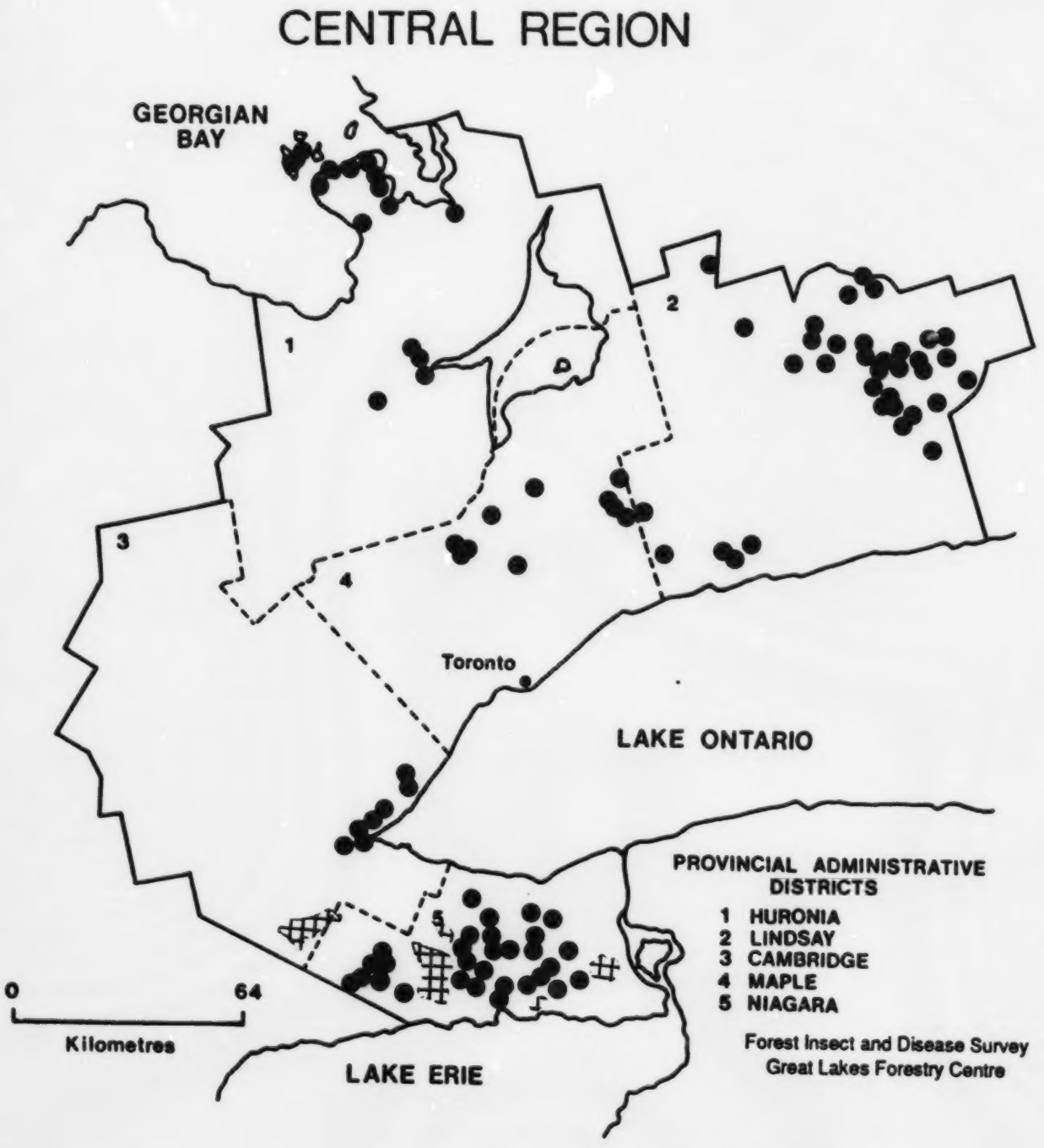

Figure 4. **Gypsy Moth**
Lymantria dispar (L.)

Areas within which moderate-to-severe defoliation occured in 1990.

or

In Huronia District, an existing area of moderate damage expanded and new areas of defoliation were detected, mainly in the northern parts of the district (Table 2). The area of moderate damage found in 1989 in Vespra Township increased to cover about 600 ha of heavy defoliation, with red oak and poplar stripped of their foliage just west of the city of Barrie. Small, isolated pockets under 60 ha in size were observed in Vespra Township adjacent to this larger infestation. They were located just to the south, in Innisfil Township, and to the southwest, at Canadian Forces Base Borden. Most of the remaining defoliation mapped in the district was found on red oak in Tiny Township (Fig. 4). Pockets of moderate-to-severe defoliation were found near the towns of Midland and Perkinsfield, and in the Thunder Beach area in Tiny Township. Smaller pockets were located around Awenda Provincial Park. Heavy defoliation was also present in 895 ha of red oak on Christian Island. Gypsy moth also caused additional damage in the northern part of Huronia District from the Sparrow Lake area northwest to Highway 69, but due to the presence of forest tent caterpillar defoliation, assessment of the gypsy moth defoliation was impossible. In an effort to reduce damage levels, a double application of B.t. was sprayed over 800 ha in Awenda Provincial Park and 60 ha in Six Mile Lake Provincial Park.

The areas previously damaged in Maple District increased in 1990, as did defoliation intensity. Some new areas of damage were detected, bringing the district total to 2,291 ha (Table 2). In 1989, a 370-ha area was damaged in King Township. In 1990, this figure increased to 1,254 ha, with moderate-to-severe defoliation of red oak and poplar over about three concessions. The area moderately damaged in 1989 in East Gwillimbury Township experienced population increases, resulting in heavy defoliation over 192 ha. New infestations were detected just north of the town of Richmond Hill in Markham Township, scattered along the eastern portion of Uxbridge Township, and just west of the town of Newmarket, in King Township (Fig. 4). A 75-ha portion of the Durham County Forest was sprayed with B.t.

After a marked increase in populations in 1989, there was a significant decrease in the area damaged in Lindsay District in 1990 (Table 2). The infestations consisted of small pockets of moderate-to-severe defoliation located mainly in the northeastern and southwestern portions of this district (Fig. 4). The largest infestation was located near the Peterborough airport, southwest of the city, and consisted of approximately 75 ha of moderate-to-severe defoliation to poplar. The remainder of the gypsy moth infestation in Lindsay District consisted of smaller scattered pockets of damage as far north as Indian Point in Bexley Township, south to the Hampton-Bowmanville area in Darlington Township and throughout the northeastern portion of the district.

The aforementioned represent the major infestations across Central Region; lower gypsy moth population levels, which usually did not result in significant defoliation, were present at many other sites in the Region.

The burlap and pheromone trapping program in provincial parks is no longer being used for the purpose of detection. In a select group of parks in three districts, trapping was carried out with the focus now on developing a sampling system to forecast damage levels (Table 3). Burlap trapping of

Table 3. Gypsy moth burlap and pheromone trapping and egg counts from line searches at select provincial parks in the Central Region of Ontario in 1990.

Location	Burlap traps: Total no. of larvae caught in 10 burlap traps		Burlap traps: Avg. no. of larvae per observation		Avg. defoliation level (%) 1990	Pheromone traps 1990			Egg count 1990
	1989	1990	1989	1990		No. of traps	Total no. of moths caught	Avg. no. per trap	
Cambridge District									
Bronte Creek	818	568	68	142	20	3	521	174	5
Huronia District									
Awenda[a]	547	105	61	26	0	3	449	150	95
Bass Lake	333	345	48	86	20	3	346	115	35
Six Mile Lakes	373	591	93	148	70[b]	3	1,401	467	>300
Springwater	103	1,563	4	391	10	3	385	128	0
Wasaga Beach	53	151	2	38	0	3	575	192	2
Lindsay District									
Serpent Mounds	502	6,377	125	1,594	10	3	413	138	6

[a] sprayed with B.t. in 1990
[b] forest tent caterpillar present also

larvae remained virtually unchanged; however, for pheromone trapping, a different type of pheromone trap and a low-release-rate lure are now in use. Comparisons of moth catches between 1989 and 1990 are no longer relevant, therefore, and they have not been included in Table 3.

Eastern Tent Caterpillar, *Malacosoma americanum* (F.)

Following a trend begun in 1989, population levels of this insect declined further in 1990 across the Region. The only area in which noteworthy damage was observed occurred on small cherry (*Prunus* spp.) shrubs along the Ingram Road and at one site in the Copeland Forest, both in Medonte Township, Huronia District. Scattered tents were seen on roadside shrubs elsewhere, but very infrequently.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

After 3 years of steadily increasing populations, this trend reversed, resulting in a smaller defoliated area in 1990 (Table 4). Regionally, the gross area of moderate-to-severe defoliation to mainly trembling aspen, red oak and sugar maple (*Acer saccharum* Marsh.) was down by 228,370 ha compared with 1989.

The largest infestations were found in the northeastern portions of Huronia District, where 29,166 ha of forest land was defoliated. Heavy defoliation was mapped from the Port Severn area north to Crooked Bay in Baxter Township; in scattered, large pockets along the district boundary in the Muskoka lakes area; and in Matchedash and Orillia townships. Smaller areas of damage were observed in the northern end of Rama Township, and smaller pockets of moderate (25 to 75%) defoliation were mapped south to the district boundary in Mara Township and in the northern half of Tiny Township (Fig. 5).

The infestation in Maple District in 1990 was smaller by about 800 ha (Table 4). It consisted of a series of small pockets of moderate defoliation to poplar east and south of Lake Simcoe in Thorah, Brock and Georgina townships. There was no defoliation on Georgina Island this year (Fig. 5).

The forest tent caterpillar infestation all but collapsed in Lindsay District (Table 4). In 1989, moderate-to-severe defoliation encompassed the northern part of the district, whereas in 1990 it was confined to small pockets of damage in Eldon and Bexley townships (Fig. 5).

HURONIA, MAPLE and LINDSAY DISTRICTS

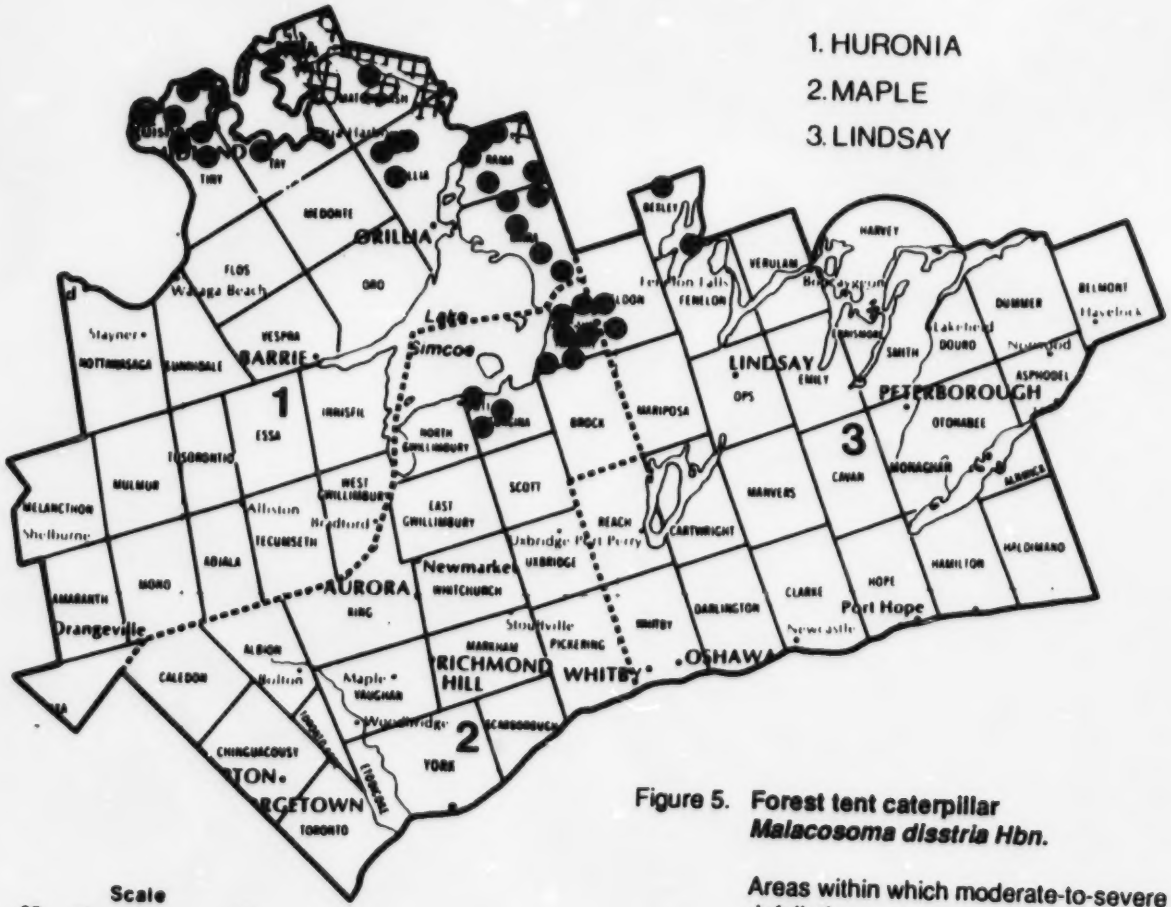

Figure 5. **Forest tent caterpillar *Malacosoma disstria Hbn.***

Areas within which moderate-to-severe defoliation occured in 1990.

or ●

Forest Insect and Disease Survey
Great Lakes Forestry Centre

Table 4. Gross area of moderate-to-severe defoliation by the forest tent caterpillar in the Central Region of Ontario from 1987 to 1990.

District	Area of moderate-to-severe defoliation (ha)				Change from 1989 to 1990
	1987	1988	1989	1990	
Huronia	7,723	104,240	124,513	29,166	-95,347
Lindsay	5,198	47,752	132,578	350	-132,228
Maple	0	0	2,130	1,335	-795
	12,921	151,992	259,221	30,851	-228,370

The forest tent caterpillar infestation has been present at high levels in parts of the Region for the past 4 years. An egg-band survey was carried out in Huronia District, and sufficient eggs were present to result in a prediction of severe damage in 1991 at the nine locations sampled (Fig. 6, Table 5). However, given that the infestation has been present in this district at high levels for the past 4 years, the accuracy of egg-band counts is somewhat reduced as a result of increases in natural biotic controls. These include parasites, predators and diseases that can cause low egg viability and high larval mortality rates. One egg-band count was carried out in Bexley Township, Lindsay District, and moderate defoliation is expected in 1991 at this site.

Table 5. Forest tent caterpillar egg-band counts on trembling aspen in the Central Region of Ontario, with infestation forecasts for 1991.

Location (Twp)	Avg. DBH of trees	Avg. no. of egg bands per tree	Infestation forecast for 1991
<u>Huronia District</u>			
Baxter	12	18	Severe
Mara	14	12	Severe
Matchedash	14	32	Severe
Orillia, Conc. III, Lot 24	14	53	Severe
Orillia, Conc. XII, Lot 21	14	29	Severe
Orillia, Conc. VIII, Lot 14	14	59	Severe
Rama, Conc. L, Lot 5	14	75	Severe
Rama, Conc. A, Lot 1	14	19	Severe
Tiny, Awenda Prov. Pk	14	8	Severe
<u>Lindsay District</u>			
Bexley	10	3	Moderate

HURONIA, MAPLE and LINDSAY DISTRICTS

Figure 6. **Forest tent caterpillar *Malacosoma disstria Hbn.***

Locations of egg-band counts and defoliation forecasts for 1991.

Severe .....●

Moderate .....■

Forest Insect and Disease Survey
Great Lakes Forestry Centre

Table 6. Other forest insects.

Insect	Host(s)	Remarks
Acantholyda erythrocephala (L.) Pine false webworm	ewP, rP	Low-to-moderate population levels were discovered in one section of the Glencairn Seed Orchard and in a red pine plantation in Medonte Twp, Huronia District.
Altica carinata Germ. Elm flea beetle	wE	Larval and adult feeding resulted in 100% foliar damage on scattered roadside trees under 12 m tall between Brantford and Ancaster along Hwy 2 and south of Cambridge along Hwy 24 for about 5 km. Skeletonizing damage reached 90% on scattered hosts along the Niagara Escarpment in South Grimsby, Clinton and Louth twps, Niagara District.
Cameraria aceriella (Clem.) Maple leafblotch miner	sM	common on regeneration and seedlings at scattered points in Huronia District
Corthylus punctatissimus (Zimm.) Pitted ambrosia beetle	sM	1 to 5% mortality of sugar maple regeneration in Oro Twp, Huronia District, and in Nassagaweya Twp, Cambridge District
Cryptococcus fagisuga Linding. Beech scale	Be	numerous scales on a few trees in northwestern Tiny Twp, Huronia District; this is the furthest-north occurrence to date
Datana integerrima G. & R. Walnut caterpillar	bWa	60 to 100% defoliation to occasional trees in Niagara District
Dioryctria zimmermani (Grt.) Zimmerman pine moth	rP	1% of the 2-m trees in a 5-ha plantation were damaged in Manvers Twp, Lindsay District.
Epinotia aceriella (Clem.) Maple trumpet skeletonizer	sM	trace populations in some stands in Huronia District

(cont'd)

Table 6. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Fenusa pusilla (Lep.) Birch leafminer	wB	80 to 100% browning of ornamentals at many sites in Niagara District and at a few sites elsewhere in the Region
Hyphantria cunea (Drury) Fall webworm	hardwoods	A slight increase in population levels was noticed this year. Tents were common in the northern part of Huronia District, particularly in Medonte and Flos twps, and a half dozen tents were observed on as many elm in Essa Twp. In Niagara District, 100% of the roadside white birch had 20% defoliation in Bertie Twp. Individual trees hosting single tents were found in Hamilton, Asphodel and Alnwick twps, Lindsay District. Single tents per host were observed at other locations across the Region.
Leucoma salicis (L.) Satin moth	European white poplar	Four trees were found with defoliation levels averaging 80% in Tosorontio Twp, Huronia District. This find represents a major western extension of the range of this insect. The next closest collection point is in the southeastern corner of Lindsay District. The moth is common throughout the eastern half of Eastern Region.
Neodiprion nanulus nanulus Schedl. Red pine sawfly	rP, ScP	A 10% infection level in one section of a 1-ha Christmas tree plantation resulted in defoliation levels of up to 10% on some trees in Brantford Twp, Cambridge District. Similar defoliation levels were found on 34% of the 1.7-m trees in a 5-ha plantation in Manvers Twp, Lindsay District.

(cont'd)

Table 6. Other forest insects (cont'd).

Insect	Host(s)	Remarks
Neodiprion sertifer (Geoff.) European pine sawfly	rP, ScP, mP	Defoliation levels averaging 5% were found on 3% of the 2-m trees in a 2-ha plantation in Manvers Twp, Lindsay District. Similar damage levels were observed in red pine (*Pinus resinosa* Ait.) plantations in Whitchurch and Uxbridge twps, Maple District, in Medonte Twp, Huronia District, and on Scots pine (*P. sylvestris* L.) in Mono Twp.
Oligonychus ununguis (Jac.) Spruce spider mite	NS, wS	High population levels resulted in up to 100% foliar discoloration to all but the current year's needles on open-grown trees throughout Niagara District. Lower levels were common throughout many other parts of the Region.
Pikonema alaskensis (Roh.) Yellowheaded spruce sawfly	wS	Defoliation averaged 12% on 48% of the 1.5-m trees in a 3-ha plantation in Eldon Twp, Lindsay District. Larger populations were present on a small number of trees and 1% recent tree mortality was also recorded.
Pissodes strobi (Peck) White pine weevil	ewP	trace populations in many plantations throughout the Region
Plagiodera versicolora (Laich.) Imported willow leaf beetle	W	75 to 100% skeletonizing of foliage of stands and ornamentals across the southern half of the Lindsay District and in many parts of the Maple, Cambridge and Huronia districts
Podapion gallicola Riley Pine gall weevil	rP	Low levels of branch mortality on 14- to 18-m trees were common in many plantations throughout the Region.

(cont'd)

Table 6. Other forest insects (concl.).

Insect	Host(s)	Remarks
Profenusa lucifex (Ross) Oak leafmining sawfly	wO	100% of the 12- to 15-m trees had 15 to 20% foliar damage at Serpent Mounds Provincial Park, Lindsay District.
Scolioneura betuleti Klug. Birch edgeminer	wB	Numerous mines were found on two 8-m trees in Caledon Twp, Maple District. This is the first record in Ontario of this insect on white birch.
Taeniothrips inconsequens (Uzel) Pear thrips	sM	Typical damage occurred at low levels on regeneration in the Iroquois Shoreline Woods at Oakville in Cambridge District.
Tetralopha asperatella (Clem.) Maple webworm	sM	Trace damage levels occurred throughout many stands in Huronia District.

TREE DISEASES

Major Diseases

Scleroderris Canker, *Ascocalyx abietina* (Lagerb.) Schläpfer-Bernhard

As part of a search throughout southern Ontario for the presence of this disease, a number of red pine and Scots pine plantations were examined in 1990. In a departure from previous years, this year's survey was restricted to trees that had an average height of <3 m. Nine red pine plantations and four Scots pine plantations were examined in Huronia District. Three red pine plantations were checked in each of the Lindsay and Maple districts, with one Scots pine plantation surveyed in Cambridge District (Fig. 7). The closest confirmed occurrence to the Central Region of the European race of Scleroderris canker is in Stephenson Township, Bracebridge District, Algonquin Region. The North American race was not found in the Region in 1990.

Table 7. Other forest diseases.

Organism	Host(s)	Remarks
Apiognomonia veneta (Sacc. & Speg.) Höhnel Anthracnose	Sy	100% leaf infection on ornamentals and natural stands in Niagara District
Arceuthobium pusillum Peck Eastern dwarf mistletoe	wS	A pocket consisting of four dead trees and six heavily infected 16-m trees was found near the Angus gate at CFB Borden in Huronia District.
Armillaria ostoyae (Romagn.) Herink Armillaria root rot	rP	2% mortality of 1.2-m trees in a 5-ha plantation in Sunnidale Twp, Huronia District
Ceratocystis ulmi (Buism.) C. Moreau Dutch elm disease	wE	Trees averaging 12-m in height in Niagara and Seneca townships, Niagara District, had mortality levels of 24% and 8%, respectively. At the same locations in Niagara and Seneca townships, infection levels of 36% and 17%, respectively, were also found. A dozen 8-m trees were found dead and dying in East Gwillimbury Twp, Maple District. This disease is becoming much more prevalent across the Region.

(cont'd)

Table 7. Other forest diseases.

Organism	Host(s)	Remarks
Coleosporium asterum (Dietel) Sydow Pine needle rust	rP	60% foliar damage to <1% of the 2-m trees in a 5-ha plantation in Bexley Twp, Lindsay District
Ganoderma applanatum (Pers.) Pat. White mottled rot	sM	Conks revealed the presence of this rot in a maple-decline plot in Richmond Hill and in a wind-thrown tree at the Metro Toronto Zoo, Maple District.
Guignardia aesculi (Peck) Stewart Leaf blotch	hChe	Leaf browning averaging 65% was found on ornamentals throughout the Niagara Peninsula, Niagara District. Approximately 80% of the leaves were affected on ornamentals in the town of Cobourg, Lindsay District. This disease was also observed at other points in the Region.
Gymnosporangium clavipes (Cooke & Peck) Cooke & Peck Quince rust	Haw	100% infection levels on the alternate host were widespread throughout the southern portion of the Region.
Marssonina brunnea (Ell. & Ev.) Magnus Marssonina leaf spot	cPo	40 to 80% infection levels on scattered trees at CFB Borden, Huronia District
Marssonina castagnei (Desm. & Mont.) Magnus Marssonina leaf spot	siPo	80% defoliation levels in small pockets in Niagara District
Marssonina juglandis (Lib.) Magnus Hickory leaf spot	bWa	10 to 90% foliar damage to open-grown trees throughout Niagara District
Rhytisma acerinum (Pers.) Fr. Tar spot	siM, sM	High infection levels caused 100% premature leaf drop in the Fonthill-Ridgeville area in Pelham Twp, Niagara District, and 30% infection levels on a couple of ornamentals in the town of Angus, Huronia District.

(cont'd)

Table 7. Other forest diseases (concl.).

Organism	Host(s)	Remarks
Sphaeropsis sapinea (Fr.) Dyko & B. Sutton Tip blight	ScP, aP	This disease continues to cause shoot and branch mortality in older Scots pine plantations and on ornamental Austrian pine (*Pinus nigra* Arnold) throughout the Region. Repeated attacks can eventually result in death of the host.

ABIOTIC DAMAGE

Drought

The combination of a poor site, 2 years of heavy defoliation by the forest tent caterpillar and 3 years of drought-like conditions affected hardwood stands in the northern part of Lindsay District. Approximately 589 ha of red oak mortality were mapped in the Stoney-Buckhorn and Sturgeon-Balsam lakes areas. A study plot in a 25-m red oak stand on Indian Point in Bexley Township disclosed 38% whole-tree mortality. Leaf browning and premature leaf drop were observed at various points in the northeastern part of Huronia District.

Table 8. Other abiotic damage.

Type of damage	Host(s)	Remarks
Frost	hard-woods	Occasional oaks and maples with 25 to 100% foliar browning were reported at a few spots in the Niagara, Lindsay and Cambridge districts.
Ice	W, tA	Breakage of large limbs and branches was common from the Dunnville area east to Port Colborne, Niagara District.
Salt	rP, ewP	Brown foliage was common on roadside plantings adjacent to major routes throughout the Region.
Scorch	sM, Ba	75 to 100% of the foliage affected on open-growing roadside trees at numerous points in the Region and 75% leaf damage on ornamental linden in Bertie Twp, Niagara District

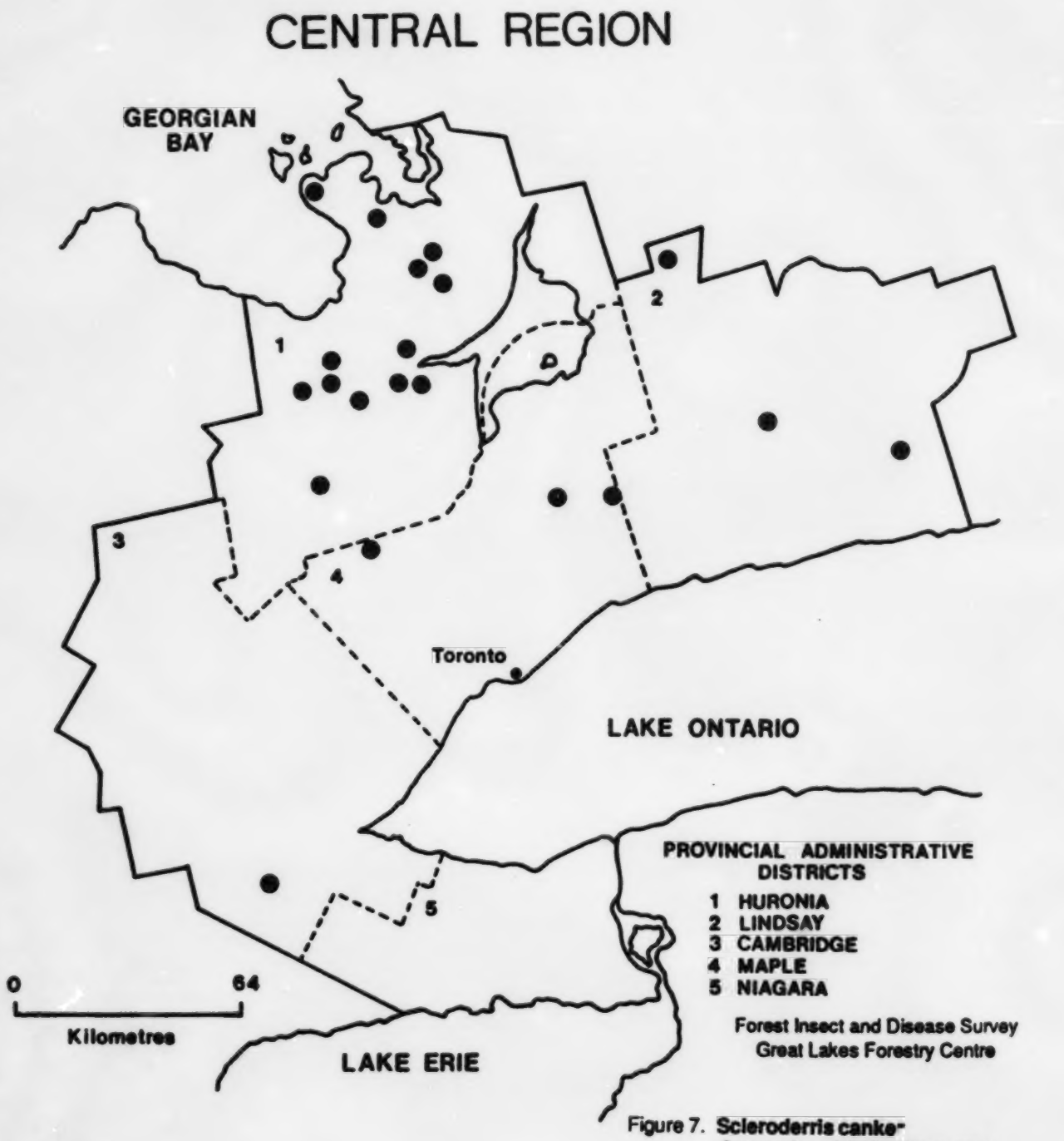

Figure 7. Scleroderris canker
Ascocalyx abietina (Lagerb.) Schläpfer - Bernhard

Locations at which plantations were surveyed in 1990..... ●

FOREST HEALTH

Maple Health

The woodlot plots established in 1987 (Fig. 8) were visited again this year; crown dieback levels were assessed and observations were made of any pests present. The urban and rural plots established in 1989 (Fig. 8) were also checked. A new urban plot was established in the city of Guelph, Cambridge District, and new urban and rural plots were installed in Maple District in 1990 (Table 10). Data on current and cumulative dieback on the woodlot plot trees are presented in Table 9 and the urban/rural plots are summarized in Table 10. Current dieback is based only on those branches that died in the past year, whereas cumulative dieback is the total accumulated dieback.

Some very minor increases in the amount of crown dieback were observed in five of the woodlot plots; the plot in Medonte Township, Huronia District, had the largest number of trees whose dieback class increased (Table 9). The other plots either stayed the same or showed some improvement in tree quality (e.g., in the Oneida Township plot, Niagara District). No significant pest levels were found on any of the woodlot plot trees.

Over all, the condition of the urban and rural plot trees is much poorer than that of the woodlot trees. This is mainly due to the greater range of disturbances and stress factors that affect these trees. In terms of changes in the level of current dieback, there were more plots that showed some improvement in tree quality, particularly in Huronia District (Table 10). Of the plots that exhibited an increase in levels of current dieback, the rural plot in Fenelon Township, Lindsay District, had the greatest increase. The results of year-to-year comparisons of cumulative dieback levels fluctuated: about four plots showed noteworthy increases in the number of trees in the lower dieback classes (Table 10). No significant pests were observed on plot trees in 1990. The usual holes and wounds typical of trees growing in this type of environment were present.

North American Maple Project

The six sugar maple plots established in 1988 were checked again this year. For this study, crown dieback was based on an estimation of the volume of crown foliage lost as a result of premature branch death. Only recently killed branches in the exposed portions of the crown were considered. Dead branches within the interior of the crown or in the lowest portion of the crown were not considered to be the result of dieback, but rather of suppression. Furthermore, "snag" branches without small twigs were not tallied as dieback. In 1990, all plots had more trees recorded in the 1-5% dieback category, but it should be noted that only one small, dead twig had to be found in the crown to place a tree in this dieback class. The plots in Nassagaweya Township, Cambridge District, and Adjala and Oro townships, Huronia District, had more trees in the 6-15% dieback class; however, no trend was noticed at any of the higher dieback levels (Table 11). Low-to-moderate (10 to 50%) defoliation levels caused by the forest tent caterpillar

CENTRAL REGION

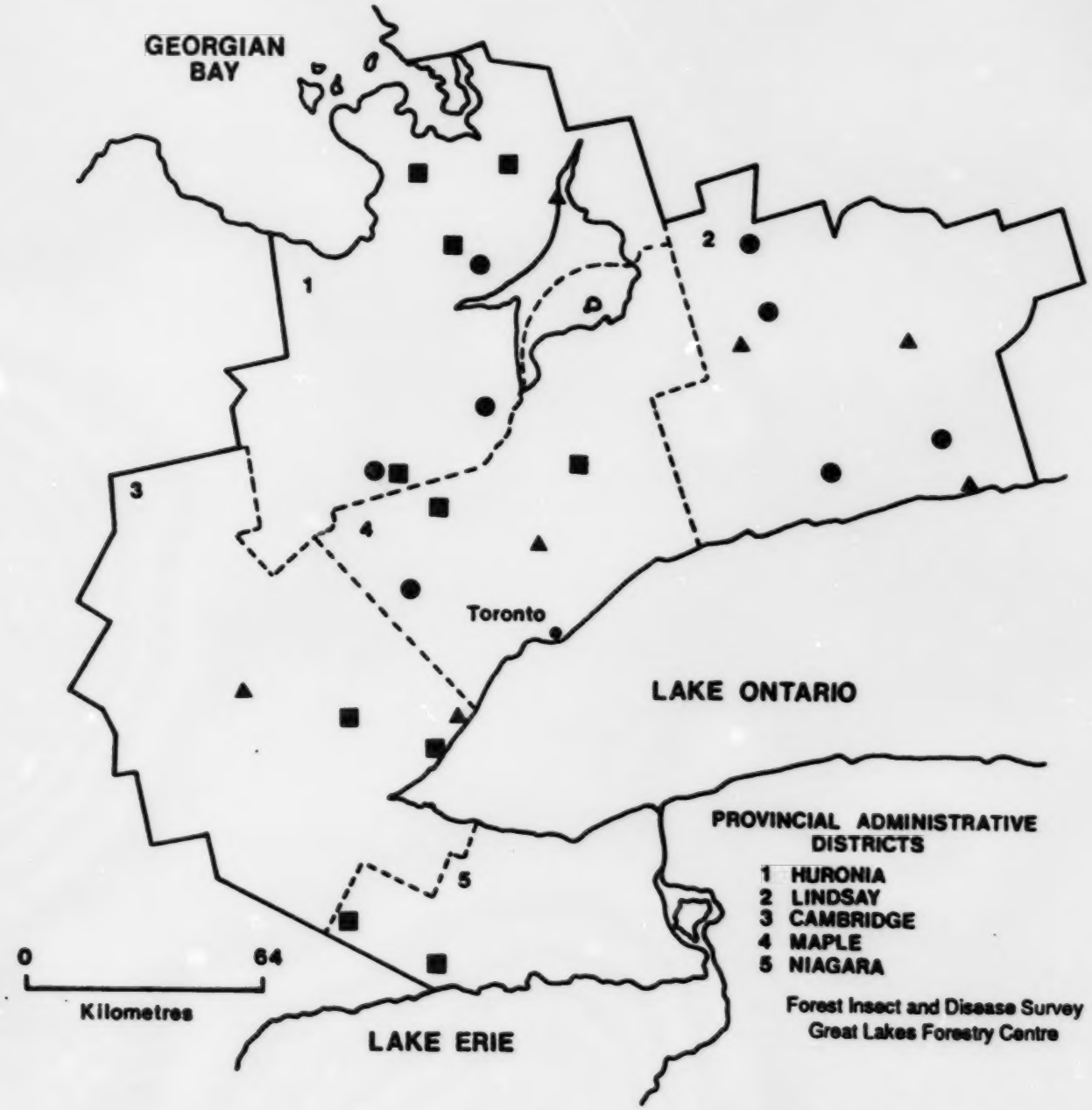

Figure 8. **Maple health plots**

Woodlot .....■
Urban .....▲
Rural.....●

Table 9. Maple health at woodlot locations in the Central Region of Ontario from 1987 to 1990 (25 sugar maple examined at each location).

Location (Twp)	Avg. ht. (m)	Avg. DBH (cm)	Year	Current dieback[a]						Cumulative dieback[a]						Trees blown down or cut
				0	1	2	3	4	5	0	1	2	3	4	5	
				No. of trees												
Cambridge District																
Nassagaweya	27	31.5	1987	25	0	0	0	0	0	25	0	0	0	0	0	0
			1988	25	0	0	0	0	0	25	0	0	0	0	0	0
			1989	25	0	0	0	0	0	25	0	0	0	0	0	0
			1990	24	1	0	0	0	0	24	1	0	0	0	0	0
Trafalgar	35	43.6	1987	25	0	0	0	0	0	25	0	0	0	0	0	0
			1988	25	0	0	0	0	0	25	0	0	0	0	0	0
			1989	23	2	0	0	0	0	23	2	0	0	0	0	0
			1990	25	0	0	0	0	0	23	2	0	0	0	0	0
Huronia District																
Adjala	21	33.0	1987	25	0	0	0	0	0	25	0	0	0	0	0	0
			1988	24	1	0	0	0	0	24	1	0	0	0	0	0
			1989	23	2	0	0	0	0	23	2	0	0	0	0	0
			1990	25	0	0	0	0	0	23	2	0	0	0	0	0
Flos	27	33.4	1987	25	0	0	0	0	0	25	0	0	0	0	0	0
			1988	25	0	0	0	0	0	25	0	0	0	0	0	0
			1989	25	0	0	0	0	0	25	0	0	0	0	0	0
			1990	25	0	0	0	0	0	25	0	0	0	0	0	0
Medonte	30	38.0	1987	25	0	0	0	0	0	25	0	0	0	0	0	0
			1988	25	0	0	0	0	0	25	0	0	0	0	0	0
			1989	21	4	0	0	0	0	21	4	0	0	0	0	0
			1990	19	6	0	0	0	0	17	7	1	0	0	0	0
Oro	23	26.5	1987	25	0	0	0	0	0	25	0	0	0	0	0	0
			1988	25	0	0	0	0	0	25	0	0	0	0	0	0
			1989	24	1	0	0	0	0	24	1	0	0	0	0	0
			1990	24	1	0	0	0	0	23	2	0	0	0	0	0
Maple District																
Albion	29	39.7	1987	25	0	0	0	0	0	25	0	0	0	0	0	0
			1988	25	0	0	0	0	0	25	0	0	0	0	0	0
			1989	24	1	0	0	0	0	24	1	0	0	0	0	0
			1990	25	0	0	0	0	0	24	1	0	0	0	0	0
Whitchurch	21	35.5	1987	25	0	0	0	0	0	25	0	0	0	0	0	0
			1988	25	0	0	0	0	0	25	0	0	0	0	0	0
			1989	25	0	0	0	0	0	25	0	0	0	0	0	0
			1990	25	0	0	0	0	0	25	0	0	0	0	0	0

(cont'd)

Table 9. Maple health at woodlot locations in the Central Region of Ontario from 1987 to 1990 (25 sugar maple examined at each location) (concl.).

Location (Twp)	Avg. ht. (m)	Avg. DBH (cm)	Year	Current dieback[a]						Cumulative dieback[a]						Trees blown down or cut
				0	1	2	3	4	5	0	1	2	3	4	5	
				No. of trees												
Niagara District																
Oneida	27	40.4	1987	25	0	0	0	0	0	25	0	0	0	0	0	0
			1988	24	1	0	0	0	0	24	1	0	0	0	0	0
			1989	19	3	1	1	0	0	19	1	3	1	0	0	1
			1990	23	1	0	0	0	0	20	4	0	0	0	0	1
South Cayuga	21	21.2	1987	25	0	0	0	0	0	25	0	0	0	0	0	0
			1988	25	0	0	0	0	0	25	0	0	0	0	0	0
			1989	24	1	0	0	0	0	24	1	0	0	0	0	0
			1990	24	1	0	0	0	0	24	1	0	0	0	0	0

[a] 0 = 0-5%, 1 = 6-20%, 2 = 21-40%, 3 = 41-60%, 4 = ≥61%, 5 = dead tree

were observed on plot trees in the sugar bush in Orillia Township, Huronia District. No significant pests or defects were found at any of the other plots examined in 1990.

Oak Health

Dieback increased slightly in four of the five red oak plots examined in Central Region in 1990. The most noteworthy increase was in the current dieback category in the plot at Farlain Lake, Huronia District, where 21 more trees entered the 6-20% dieback class and six additional trees entered the 21-40% class (Table 12). The method used to assess dieback in the oak plots is the same one used in the 25-tree maple health plots. Mortality increased by three trees in each of the plots in Uxbridge and Clarke townships in the Maple and Lindsay districts, respectively, and by one tree at the Farlain Lake plot in Huronia District. Generally, it was found that mortality was accompanied by Armillaria root rot. Increased cumulative dieback was recorded in three of the plots, with the most damage at the Farlain Lake plot (Table 12). The best improvement since 1989 occurred at the Awenda Provincial Park plot, Huronia District.

Plot trees damaged by the forest tent caterpillar and, to a lesser degree, by the gypsy moth at Farlain Lake, had an average defoliation level of 27%; however, a few individual trees sustained from 80 to 90% defoliation. Average defoliation levels of 10% were present on the red oak in Clarke Township, Lindsay District, with gypsy moth being the only pest in this case.

Table 10. Maple health at urban and rural locations in the Central Region of Ontario from 1989 to 1990 (25 maple trees examined at each location).

Location[a]	Avg. ht. (m)	Avg. DBH (cm)	Year	Current dieback[b] (No. of trees)						Cumulative dieback[b] (No. of trees)						Trees blown down or cut
				0	1	2	3	4	5	0	1	2	3	4	5	
Cambridge District																
Guelph (U)	18	70.5	1990	13	11	1	0	0	0	13	11	1	0	0	0	0
Oakville (U)	20	82.5	1989	13	10	2	0	0	0	13	10	2	0	0	0	0
			1990	16	8	1	0	0	0	14	10	1	0	0	0	0
Huronia District																
Mono Twp (R)	18	54.0	1989	1	9	6	7	1	1	1	9	5	7	2	1	0
			1990	10	9	4	0	0	1	1	10	4	4	4	2	0
Orillia (U)	21	66.1	1989	7	14	4	0	0	0	7	11	4	3	0	0	0
			1990	18	6	1	0	0	0	7	12	4	1	1	0	0
Oro Twp (R)	19	66.9	1989	12	12	1	0	0	0	12	11	2	0	0	0	0
			1990	21	4	0	0	0	0	9	14	2	0	0	0	0
West Gwillimbury Twp (R)	15	69.9	1989	8	8	4	5	0	0	8	7	4	5	1	0	0
			1990	12	6	6	1	0	0	8	7	4	4	2	0	0
Lindsay District																
Clarke Twp (R)	15	72.9	1989	15	8	2	0	0	0	9	7	6	1	2	0	0
			1990	13	10	0	0	0	1	7	10	5	1	0	1	1
Cobourg (U)	18	68.5	1989	12	10	3	0	0	0	10	10	3	1	1	0	0
			1990	11	11	3	0	0	0	9	10	3	2	1	0	0
Fenelon Twp (R)	14	57.3	1989	13	8	3	1	0	0	12	7	5	1	0	0	0
			1990	5	14	5	1	0	0	5	14	3	3	0	0	0
Hamilton Twp (R)	18	71.1	1989	12	9	4	0	0	0	9	6	9	1	0	0	0
			1990	11	11	0	0	0	0	6	11	4	1	0	0	3
Little Britain (U)	21	67.6	1989	14	9	2	0	0	0	10	9	6	0	0	0	0
			1990	11	10	1	0	0	0	9	10	2	1	0	0	3
Ops Twp (R)	13	61.1	1989	5	15	4	1	0	0	2	8	10	4	1	0	0
			1990	6	15	0	0	0	0	1	10	8	2	0	0	4
Peterborough (U)	19	51.1	1989	18	7	0	0	0	0	12	13	0	0	0	0	0
			1990	20	5	0	0	0	0	14	11	0	0	0	0	0
Maple District																
Chinguacousy Twp (R)	18	70.9	1990	6	10	5	4	0	0	6	8	5	5	0	0	0
Richmond Hill (U)	15	57.9	1990	19	4	0	2	0	0	19	3	1	2	0	0	0

[a] U = urban, R = rural (roadside)
[b] 0 = 0-5%, 1 = 6-20%, 2 = 21-40%, 3 = 41-60%, 4 = ≥61%, 5 = dead tree

Table 11. Crown condition of sugar maple at six North American Maple Project plots in the Central Region of Ontario from 1988 to 1990.

Location (Twp)	Avg. DBH (cm)	Year	No. of trees	Total dead crown (%) No. of trees										Trees dead
				0	1-5	6-15	16-25	26-35	36-45	46-55	56-65	66-95	96-100	
Cambridge District														
Nassagaweya[a]	30.0	1988	49	26	19	3	0	1	0	0	0	0	0	0
		1989	49	10	34	4	1	0	0	0	0	0	0	0
		1990	49	0	39	9	1	0	0	0	0	0	0	0
Huronia District														
Adjala[a]	30.4	1988	65	24	37	4	0	0	0	0	0	0	0	0
		1989	65	2	49	8	4	1	0	0	0	0[c]	0	0
		1990	65	0	43	14	5	0	0	0	0	0[c]	0	2
Orillia[b]	36.7	1988	53	25	24	3	1	0	0	0	0	0	0	0
		1989	53	16	29	7	1	0	0	0	0	0	0	0
		1990	53	0	47	3	2	1	0	0	0	0	0	0
Oro[a]	23.5	1988	80	50	27	3	0	0	0	0	0	0	0	0
		1989	66	14	49	3	0	0	0	0	0	0	14[d]	0
		1990	66	1	53	11	1	0	0	0	0	0	14[d]	0
Lindsay District														
Belmont[b]	26.6	1988	55	0	43	9	2	0	0	0	0	0[c]	0	0
		1989	55	0	38	10	6	0	0	0	0	0[c]	0	0
		1990	55	0	46	7	1	0	0	0	0	0[c]	0	0
Maple District														
Vaughan[b]	30.8	1988	47	33	8	5	0	0	0	0	0	0	0	0
		1989	47	23	19	4	0	0	0	0	1	0	0	0
		1990	47	1	44	1	0	0	1	0	0	0	0	0

[a] undisturbed woodlot

[b] trees currently tapped for maple syrup

[c] one tree was in the 86-95% dieback class.

[d] these trees were blown down or cut

Table 12. Oak health at five locations in the Central Region of Ontario from 1984 to 1990 (100 red oak examined at each location).

Location (Twp)	Average[a] ht. (m)	Average[a] DBH (cm)	Year	Current dieback[b] 0	1	2	3	4	5	Cumulative dieback[b] 0	1	2	3	4	5	Trees blown down or cut
				No. of trees						No. of trees						
Huronia District																
Tiny Township	21.9	25.9	1984	76	0	0	0	0	0	6	56	9	4	1	9	15
Awenda Prov Pk			1985	74	2	0	0	0	0	4	62	9	0	1	9	15
			1986	75	0	0	0	0	1	31	41	2	1	0	10	15
			1987	69	5	0	0	0	1	41	29	4	0	0	11	15
			1988	49	25	0	0	0	0	30	37	7	0	0	11	15
			1989	10	58	4	2	0	0	8	49	13	4	0	11	15
			1990	19	48	8	1	0	0	7	48	11	7	1	11	15
Tiny Township	22.0	26.0	1984	67	0	0	0	0	0	0	31	25	6	5	33	0
Farlain Lake			1985	64	1	0	0	0	1	0	49	12	3	1	34	1
			1986	61	0	0	0	0	0	28	25	7	1	0	33	6
			1987	56	4	1	0	0	0	36	22	2	1	0	33	6
			1988	-c	-c	-c	-c	-c	0	23	32	5	1	0	33	6
			1989	33	26	2	0	0	0	25	27	8	1	0	33	6
			1990	3	47	8	1	1	1	3	36	17	3	1	34	6
Mulmur Township	21.0	28.2	1984	90	2	0	0	0	2	1	52	33	8	0	4	4
Dufferin Forest			1985	89	3	0	0	0	0	0	71	19	2	0	4	4
			1986	92	0	0	0	0	0	55	35	2	0	0	4	4
			1987	87	2	1	0	0	2	64	22	3	0	1	6	4
			1988	61	26	1	1	0	1	52	33	3	0	1	7	4
			1989	48	33	5	1	0	2	39	34	12	2	0	9	4
			1990	27	52	5	2	1	0	25	48	10	3	1	9	4
Maple District																
Uxbridge Twp	21.2	26.1	1984	74	2	0	0	0	1	0	40	27	6	3	24	0
Durham Forest			1985	75	0	0	0	0	1	0	53	17	4	1	25	0
			1986	75	0	0	0	0	0	0	62	12	1	0	25	0
			1987	53	20	1	0	0	1	4	46	24	0	0	26	0
			1988	8	47	1	0	0	0	3	33	19	1	0	26	0
			1989	43	28	1	1	0	1	7	47	17	2	0	27	0
			1990	35	31	3	0	0	4	10	44	14	1	0	31	0
Lindsay District																
Clarke Twp	20.6	22.9	1984	87	3	0	0	0	1	37	39	10	2	2	10	0
			1985	74	12	1	2	0	1	21	45	19	2	2	11	0
			1986	86	1	1	0	1	0	28	38	16	5	2	11	0
			1987	80	7	1	0	0	1	37	42	6	2	1	12	0
			1988	49	32	4	0	2	1	23	54	7	1	2	13	0
			1989	67	16	2	1	0	1	28	48	7	1	2	14	0
			1990	54	29	0	0	0	3	15	62	5	1	0	17	0

[a] from 1977 measurements

[b] 0 = 0-5%, 1 = 6-20%, 2 = 21-40%, 3 = 41-60%, 4 = ≥61%, 5 = dead tree

[c] data missing - 75 trees examined

Acid Rain National Early Warning System (ARNEWS)

Acid rain is more than just precipitation with below-average pH: it has become the popular term for all forms of airborne pollution such as wet or dry deposition of pollutants, gaseous pollutants, etc. In 1984 and 1985, two plots were established in the Region, one in a sugar maple stand in Oro Township, Huronia District, and the other in an eastern white pine *(Pinus strobus* L.) plantation in Erin Township, Cambridge District. The purpose of these plots is to monitor changes in the condition of these forest trees. The presence of and changes in biotic and abiotic factors or symptoms not attributable to pollution are also monitored. No damage was observed that could be linked to pollution, and only trace damage levels by the maple webworm, maple trumpet skeletonizer and leaf hoppers (Cicadellidae) were present on the sugar maple plot trees in Oro Township. There was no damage of any kind found on the eastern white pine in Erin Township.

SPECIAL SURVEYS

Forest Tree Nursery Report

The two OMNR forest tree nurseries responsible for supplying most of the planting stock for south-central Ontario are located at Midhurst in Huronia District and at Orono in Lindsay District. This section summarizes the status of pests encountered by FIDS Rangers during visits to these nurseries.

The heaviest damage found during the course of the summer at the Midhurst Forest Tree Nursery was observed on the first visit (in May). Damage caused by frost resulted in 100% shoot mortality to all the green ash *(Fraxinus pennsylvanica* var. *subintegerrima* [Vahl] Fern.) seedlings in compartment B8. This damage was probably a result of minimum temperatures of from -1.0 to 1.5°C recorded at the nursery from 12 May to 5 June. Actual air temperatures at ground level were likely even lower, as the aforementioned temperatures were recorded at a weather station rather than in the nursery. In the Midhurst seed orchard, 12 leaders were found damaged by the white pine weevil on 3-m eastern white pine. Very low levels (1%) of white spruce seedlings in compartments A4, A11 and A34 had stem girdling damage, probably caused by leatherjackets, the larval stage of the marsh crane fly *(Tipula paludosa* Meiger). Tip-blight infections resulted in dead terminal buds in <1% of the red pine in compartments C14 and C20. Cedar leafminer populations remained at relatively low levels on windbreak trees; however, Armillaria root rot continues to kill young windbreak trees.

Frost also caused some damage at the Orono Forest Tree Nursery, with 15 and 13% of the terminal buds of Norway spruce *(Picea abies* [L.] Karst.) killed in compartments T32 and T13, respectively. On 11 and 12 May, temperatures dipped to 0.1 and -2.0°C and on 5 June, the minimum temperature recorded was 1.8°C. Much lower damage levels were also observed on hardwoods in compartments T72 and on white spruce in compartment T32. Gypsy moth population levels were high on the red oak in compartment T72, with as many as seven larvae per leaf on 73% of the 22-cm seedlings. Numerous gypsy moth

larvae were also found on eastern white pine seedlings in compartment S12. Spruce budworm feeding resulted in average current defoliation levels of 40% on white spruce at the Orono seed orchard. Cedar leafminer populations were sufficient to cause browning in the 5-10% range on windbreak trees.

Climatic Data

Abiotic damage is most commonly caused by extremes in weather; examples include frosts or low precipitation levels that cause drought stress. Climate also has an important effect on the development of insect and disease problems. Table 13 lists the mean monthly temperatures and total precipitation for 1990, as recorded by the Atmospheric Environment Service. Deviations from the 30-year average values are also reported. Climate can vary greatly from district to district, and these data represent information from only two stations in Central Region.

Table 13. A summary of temperature and precipitation for 1990 at two locations in the Central Region of Ontario.

Location	Month	Mean temperature (°C)		Deviation from normal (°C)	Total precipitation (mm)		Deviation from normal (mm)
		Normal	Actual		Normal	Actual	
Peterborough Airport	Jan.	-9.3	-3.1	+6.2	44.1	49.0	+4.9
	Feb.	-8.5	-5.8	+2.7	48.9	80.2	+31.3
	March	-2.5	-0.7	+1.8	62.9	70.6	+7.7
	April	6.0	7.3	+1.3	71.8	92.4	+20.6
	May	12.1	10.6	-1.5	57.1	88.0	+30.9
	June	16.8	17.3	+0.5	60.4	87.2	+26.8
	July	19.2	19.3	+0.1	77.9	94.4	+16.5
	Aug.	18.1	19.0	+0.9	74.2	77.6	+3.4
	Sept.	14.0	13.1	-0.9	72.9	42.5	-30.4
	Oct.	7.9	7.2	-0.7	59.9	113.8	+53.9
	Nov.	2.1	2.7	+0.6	69.4	51.5	-17.9
	Dec.	-6.0	-3.1	+2.9	74.3	137.6	+63.3
Lester B. Pearson International Airport	Jan.	-6.7	-0.8	+5.9	50.4	36.8	-13.6
	Feb.	-6.1	-3.5	+2.6	46.0	76.9	+30.6
	March	-1.0	0.7	+0.3	61.1	28.7	-32.4
	April	6.2	8.4	+2.2	70.0	53.0	-17.0
	May	12.3	11.6	-0.7	66.0	86.6	+20.6
	June	17.7	18.7	+1.0	67.1	69.4	+2.3
	July	20.6	20.9	+0.3	71.4	68.4	-3.0
	Aug.	19.7	20.3	+0.6	76.8	112.6	+35.8
	Sept.	15.5	15.3	-0.2	63.5	42.8	-20.7
	Oct.	9.3	9.5	+0.2	61.8	87.8	+26.0
	Nov.	3.3	4.6	+1.3	62.7	39.6	-23.1
	Dec.	-3.5	-1.0	+2.5	64.7	112.7	+48.0